

25X1

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0

THE ECONOMIC DIMENSIONS  
OF THE ZAMBIA RESCUE OPERATION\*

In the emotional aftermath of Southern Rhodesia's unilateral declaration of independence (UDI), Zambian President Kenneth Kaunda may feel compelled to precipitate a complete economic break with Rhodesia. Although it is less likely, initiative for such a break could come from Rhodesia. An accumulation of actions and reactions could bring about a complete severing of all economic ties between the two countries. However this break comes about, the consequences for Zambia would be serious. One result of cutting the economic ties between Rhodesia and Zambia would be the elimination of most of the 700,000 tons\*\* of copper from world markets otherwise expected in the next year because of the heavy dependence of Zambian copper production on Rhodesian coal and electric power and because the major rail link to Zambia is through Rhodesia. Such an eventuality would pose difficult adjustment problems for much of the industrialized West because copper is already in short supply.

There is no way in the short run by which the United States or the United Kingdom could offset the major consequences for Zambia of such a breakdown. Several economic and financial problems would be created immediately. The Free World need for Zambian copper is critical, and efforts would have to be made to continue production. The remaining limited supplies of copper from other Free World producers would have to be rationed. Furthermore, the Zambian economy would have to be kept afloat at some minimum level and its dominant mining sector kept functioning, at least on a care-and-maintenance basis.

1. Rhodesia's Economic Stranglehold

Zambia's economic dependence on goods and services provided by Rhodesia is almost complete. In order to maintain economic activity at anything like the present levels, Zambia must have access to Mozambique's Indian Ocean ports via Rhodesia, an uninterrupted flow of electricity from the jointly owned Kariba power complex, and a continuous supply of coal from Rhodesia's Wankie fields. Rail and road routes to the sea, other than those transiting Rhodesia, are available to Zambia. However, they collectively lack the capacity to offset the loss of access to the Rhodesian system. Zambia's embryonic coal industry, under the most optimistic assumptions, could provide only a small fraction of the coal Zambia would require if it is denied Wankie coal. Although there is substantial unused thermal electric generating capacity in Zambia, power generation from these plants would necessarily depend on imported coal, and in any event Zambian generating stations could not offset the loss of Kariba power.

\* The estimates and conclusions in this brief represent the best judgment of this Office as of 23 November 1965.

\*\* Tonnages are given in short tons.

## 2. Copper Production\*

With the exception of a modest amount of electric power imported from Katanga, Zambia's annual production of some 700,000 tons of copper depends completely on electricity supplied from Kariba and on electricity generated in Zambia's thermal powerplants, which use Rhodesian coal. Substantial additional amounts of Wankie coal are consumed in processing Zambian copper concentrates through the blister stage. Without these supplies, it would not be possible to maintain production at 700,000 tons, and output would fall sharply. The limiting factor in the first instance is the capacity of the Zambian thermal powerplants. Although these plants now operate only intermittently, they could produce at capacity 1.13 billion kilowatt-hours per year. In addition, 400 million kilowatt-hours probably can be imported per year from Katanga. Because of line losses and municipal and other uses, the net electric power available to the copper companies annually would be about 1.1 billion kilowatt-hours. This amount of power would allow the mines to produce annually about 450,000 tons of blister copper or 400,000 tons of electrolytic copper. The coal required for this level of copper production would be about 1.5 million tons -- 775,000 tons to generate domestic power, 400,000 tons to smelt the copper, and about 325,000 tons to operate the railroad within Zambia to service this level of economic activity. Such a rate of production would be dependent, however, on the physical ability to import this amount of coal in addition to the other mining supplies and food-stuffs necessary to maintain the population at a level of austerity. The importation of such quantities of coal into Zambia is not believed to be possible.

## 3. Austerity in Zambia\*\*

At the current level of economic activity, Zambia imports about 2 million tons of goods annually. To maintain the Zambian economy at an austerity level and to keep the mining industry on a care-and-maintenance basis, it is estimated that imports could be reduced to about 900,000 tons as follows:

<u>Commodity</u>	<u>Thousand Tons</u>
Coal	415
POL	150
Food	140
Other	190

\* For details on required inputs of electric power, see Appendix A.

\*\* For details on inputs necessary to sustain the Zambian economy at austerity levels, see Appendix B.

This estimate of coal requirements assumes a doubling of imports of Katangan power to 400 million kilowatt-hours annually, and hence is probably conservative. The estimate of coal imports could be reduced if Zambia's own fields at Kandabwe could begin significant production. Conflicting estimates suggest that Kandabwe could produce at an annual rate of between 200,000 and 400,000 tons. Depending on the level of Kandabwe production (and the present level is negligible), the volume of all imports needed to sustain the economy on a care-and-maintenance basis would total between 500,000 and 700,000 tons annually.

#### 4. Transport Alternatives\*

In the final analysis the controlling factor limiting the effectiveness of any Zambia rescue operation will be the availability of transport capacity on routes which avoid Rhodesia. The three possibilities are rail, road, and air, which in turn are limited primarily by port capacity in East Africa. The estimated excess inbound capacity of all roads from Zambia to Tanzanian Indian Ocean ports is about 100,000 tons annually. Perhaps 100,000 tons per year is the maximum that can be carried, using readily available aircraft and without time-consuming improvements to East African airports. In addition, by using the East African railroad system, another 100,000 tons can be made available to Zambia. Thus the combined inbound rail, road, and airlift capacity through Tanzania is 300,000 tons per year. The rail-river transport system through Congo (Leopoldville) might also carry an additional 100,000 tons of inbound cargo.

The only major rail route from Zambia to the sea that does not pass through Rhodesia is the Benguela Railroad through Portuguese Angola. The surplus capacity of this wood-burning railroad is subject to considerable conjecture, but it is probably at least 600,000 tons -- 400,000 tons inbound toward Zambia and 200,000 tons outbound.

Theoretically, Zambia would be able to draw on a total inbound capacity by rail, road, river, and air of about 800,000 tons. Katanga, however, would very likely have first call on the surplus inbound capacity of the Benguela Railroad to offset the 450,000 tons of goods now imported through Rhodesia, including 300,000 tons of Wankie coal and 150,000 tons of general merchandise, and thus would more than offset the available surplus inbound capacity.

As indicated above, under favorable circumstances, between 500,000 and 700,000 tons of imports annually are required to support Zambia on a care-and-maintenance basis. If only 300,000 tons of imports are available through Tanzania and an additional 100,000 tons through Congo (Leopoldville), it is apparent that it would be virtually impossible to support Zambia adequately, even at a sharply reduced level of economic activity.

\* For details on transport facilities, see Appendix C.

APPENDIX A

LIMITATIONS IMPOSED ON THE MAXIMUM PRODUCTION  
OF ZAMBIAN COPPER  
BY AVAILABILITY OF ELECTRIC POWER

The availability of electric power in Zambia places rigid limitations on copper production. The maximum quantity of Zambian copper which can be produced in the absence of Kariba power and Wankie coal from Rhodesia has been estimated in the following fashion. It was assumed that all Zambian thermal powerplants will operate at full capacity and that the availability of coal will not be a limiting factor. Furthermore, the present import of 200 million kilowatt-hours of electricity from Katanga was doubled to 400 million kilowatt-hours. Allowing for various losses and other essential uses, it was estimated that Zambia would have access to 1.1 billion kilowatt-hours annually under these maximum assumptions. Using the experience factors below, it was determined that a maximum of 450,000 tons of blister copper could be produced if refining facilities were shut down to conserve electricity. If refining were carried on, only 400,000 tons of electrolytically refined copper could be produced.

The estimated electric power requirements in Zambia per ton of refined copper are as follows\*:

	<u>Kilowatt-Hours</u> <u>per Ton</u>	<u>Percent</u>
Mining	795	29.2
Concentrating	1,270	46.7
Smelting and converting	205	7.5
Electrolytic refining	180	6.6
Auxiliary shops	270	10.0
Total	<u>2,720</u>	<u>100.0</u>

Thus the tonnage of copper that can be produced is derived by dividing the amount of power available by 2,720 kilowatt-hours. This will give the amount of electrolytic (refined) copper that can be produced. To arrive at an estimate for smelter (blister) copper, 180 kilowatt-hours per ton were subtracted, thus further reducing the power input required by using a slightly lower figure for the needs of auxiliary shops.

\* Thirty-nine tons of ore are required to recover one ton of refined copper.

## APPENDIX B

MINIMUM INPUTS NECESSARY  
TO SUSTAIN THE ZAMBIAN ECONOMY AT AUSTERITY LEVELS  
AND THE MINING INDUSTRY  
ON A CARE-AND-MAINTENANCE BASIS  
AND MAXIMUM TRANSPORT CAPABILITIES AVAILABLE

Under the assumption that Rhodesia cuts off supplies of electric power from Kariba, halts shipments of Wankie coal, and denies Zambia the use of rail transit facilities, the estimated annual imports necessary for maintenance of the Zambian mines and a minimum level of other economic activities are as follows:

	<u>Thousand Short Tons</u>
Coal	415
POL, food, and other	480
Total	<u>900</u> (rounded)

Potential domestic production of fuel amounts to 200,000 to 400,000 tons, leaving a deficit of 500,000 to 700,000 tons that would have to be met by imports. Available inbound transport capacity, however, amounts to only 400,000 tons, leaving an import shortfall of 100,000 to 300,000 tons.

In order to provide for care and maintenance of the mines and to provide a minimum level of other activity, this Office estimates that 415,000 tons of coal per year would be required.

About 100 megawatts of power capacity is needed for the care and maintenance of all Zambian copper mines. A large portion of these needs can be imported from hydroelectric facilities in Congo (Leopoldville). The estimates of the ability of Congo (Leopoldville) to make power capacity available, however, have ranged from 40 to 100 megawatts. The midpoint of these estimates, 70 megawatts, is used. Coal requirements of 130,000 tons needed to convert the remaining 30 megawatt capacity into electrical output is obtained by applying factors developed in Appendix C. Municipal needs and line losses in 1964 totaled 250 million kilowatt-hours. Coal inputs of 200,000 tons needed to generate this output is obtained by applying the fuel consumption/power production ratio derived in Appendix C. This coal figure is for present consumption; therefore, 135,000 tons of coal is used here to indicate a lower level of activities. The railroads will need 150,000 tons of coal, assuming a much reduced level of activity.

In addition to coal, estimated annual Zambian import requirements for a minimum level of economic activities are as follows:

	<u>Thousand Tons</u>
Food	140
POL	150
Other	190
Total	<u>480</u>

Some domestic coal production is possible. An additional 20,000 to 40,000 tons of coal-equivalent in cordwood for use in thermal power-plants has been included. The range possible for domestic fuel supplies is 200,000 to 400,000 tons, but this is highly optimistic. The estimated annual inbound transportation capacity is as follows:

	<u>Thousand Tons</u>
Benguela Railroad	400
Through Tanzania by road, rail, and airlift	300
Congo (Leopoldville), Katanga to Matadi	100
Maximum excess capacity available	<u>800</u>

The Congo (Leopoldville) mining industry, which is the main user of the Benguela route, probably would absorb all this line's excess capacity in order to replace lost tonnages imported via Rhodesian Railways. Thus the remaining maximum inbound capacity available to Zambia is 400,000 tons and includes the 300,000 tons shipped via Tanzania and the 100,000 tons transported from Matadi to Katanga.

APPENDIX C

MAXIMUM ELECTRIC POWER AVAILABLE  
TO THE ZAMBIAN COPPER INDUSTRY  
AND THE NECESSARY COAL INPUT

If Rhodesia cuts off supplies of electric power from Kariba, it is estimated that Zambian thermal powerplants which service the copper-belt can generate power at the rate of 1,130 million kilowatt-hours per year. In addition it is assumed that 400 million kilowatt-hours can be imported from Congo (Leopoldville). Of this total of 1,530 million kilowatt-hours, 430 million will be consumed by municipalities and by line loss, leaving 1,100 million kilowatt-hours available for the copper mines. It is also estimated that about 775,000 tons of coal are needed by Zambian thermal powerplants to generate 1,130 million kilowatt-hours.

Current maximum electric power obtainable from Zambian thermal powerplants is determined by applying the 1954 operating factor (when these plants were operating near capacity) to the present capacity. Thus in 1954, thermal powerplants servicing the Zambian copperbelt had a capacity of 168.2 megawatts and an output of 904 million kilowatt-hours. The generating plants, therefore, operated 5,375 hours that year. The present capacity of 205 megawatts multiplied by a rounded operating factor of 5,500 hours yields an annual output of 1,130 million kilowatt-hours.

The 1954 fuel input for Zambian thermal powerplants on the copper-belt is shown below in terms of coal equivalents:

	<u>Thousand Tons</u>
Coal	354
Cordwood	232
Wasteheat steam	139
Oil	5
Total	<u>730</u>

Coal requirements of 912,000 tons were determined by applying the above fuel consumption/power production ratio to the estimated maximum thermal generating output. Wasteheat steam from the copper smelters represents the equivalent of 139,000 tons of coal. Thus about 775,000 tons of coal would be needed to reach maximum output.



25X1

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0

Next 1 Page(s) In Document Exempt

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0

**W A R N I N G**

This material contains information affecting the National Defense of the United States within the meaning of the espionage laws, Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

25X1

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0

Next 11 Page(s) In Document Exempt

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0

**SECRET**

NO FOREIGN DISSEM

NO FOREIGN DISSEM

**SECRET**

Approved For Release 2005/05/16 : CIA-RDP79T01003A002400210002-0